REMARKS

Enclosed herewith is a Substitute Specification in which the specification as filed has been amended in various places to correct typographical and grammatical errors, and also to add section headings.

In support of the above, enclosed herewith is a copy of the specification as filed marked up with the above changes.

The undersigned attorney asserts that no new matter has been incorporated into the Substitute Specification.

The claims have been amended to more clearly define the invention as disclosed in the written description. In particular, claim 2 has been cancelled, and claim 1 has been amended to include the limitations of cancelled claim 2. In addition, the claims have been amended for clarity.

The Examiner has rejected claims 1-11 under 35 U.S.C. 102(e) as being anticipated by U.S. Patent 6,781,939 to Tanoue et al.

The Tanoue et al. patent discloses an information recording medium where address mark comprising pattern suitable for prevention of detection error is recorded, and cutting apparatus for recording the information recording medium, in which each track has a plurality of sectors, and each sector includes a header field, a mirror field and a recording field. As shown in Fig. 4 therein, each header field HF includes 4 "sub-headers" HF1-HF4,

Each of the sub-headers includes a VFO field containing a continuously repeated pattern, followed by an address mark (AM) field of 3-bytes serving to detect the boundary between blocks indicating the recording position of a PID field, a physical ID (PID) field containing sector information and a sector number, an ID error detection code (IED) field for the PID, and a post ambles (PM) field containing state information necessary for demodulation.

The subject invention concerns an information carrier having a plurality of concentric tracks provided with servo-patterns having headers alternating with track portions for containing recorded information. Each header includes a VFO field containing a repeated synchronizing pattern, and a first ID field ID1 containing the address of the segment. In order to guard against erroneously reading the segment address, this information is also contained in a second ID field ID2. It should be noted that the ID fields ID1 and ID2 also contain a cyclic redundancy check code word. The header further includes and information field DI located between the first and second ID fields ID1 and ID2. As described in the Substitute Specification on page 12, paragraph [0034], this information field DI holds information describing properties of the information carrier.

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v.*

Union Oil Co. of California, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

In the current Office Action, the Examiner equates the synchronizing fields (VFO1, VFO2) in the first two sub-headers HD1 and HD2 to the VFO field of the subject invention, the PID1 of the first sub-header HD1 to the first identification field ID1 and the PID2 of the second sub-header HD2 to the second identification field ID2. However, the Examiner then states, quoting from claim 1 of the subject invention, "characterized in that the headers in at least a group of headers also comprise an information field located in between the first identification field and the second identification field, said information field comprising marks representing information (see PID1 in Fig. 4 for details)."

Applicants respectfully submit that the Examiner is mistaken. In particular, if PID1 is to be considered the first identification field, then it cannot be the information field located between the first and second identification field.

The Substitute Specification, on page 12, paragraph [0034], describes the information describing properties of the information carrier as "for example, the number of recording layers, the type of the recording layers, the read power, the write power, the ratio of the erase power to the write power, the ratio of the bias power to the write power, parameters used in an Optimum Power Control (OPC) procedure in a recording device, and parameters

describing the shape of a sequence of write pulses generated by a recording device to record data on the information carrier."

Referring to Fig. 4 of Tanoue et al., PID1 includes sector information comprising bits b31 - b24, and sector number comprising bits b23 - b0. It should be apparent that the sector information and sector number are not "information describing properties of the information carrier".

Further, referring to Fig. 4 of Tanoue et al., the fields appearing between PID1 and PID2 include IED1, PA1, VFO2 and AM. As described above, each of these fields has a particular function and does not include "information describing properties of the information carrier". In fact, as described in the Substitute Specification on page 12, paragraph [0033], the ID field includes a "cyclic redundancy check (CRC) code word", which, as such, would correspond to IED1.

In view of the above, Applicants believe that the subject invention, as claimed, is neither anticipated nor rendered obvious by the prior art, and as such, is patentable thereover.

Applicants believe that this application, containing claims 1 and 3-11, is now in condition for allowance and such action is respectfully requested.

Respectfully submitted,

by _____
Edward W. Goodman, Reg. 28,613
Attorney
Tel.: 914-333-9611

CERTIFICATE OF MAILING

It is hereby certified that this correspondence is being deposited with the United States Postal Service as First-class mail in an envelope addressed to:

COMMISSIONER OF PATENTS AND TRADEMARKS
P.O. BOX 1450
ALEXANDRIA, VA 22313-1450

On Nov. 17 2004

By _____

INFORMATION CARRIER, APPARATUS FOR RETRIEVING INFORMATION FROM THE INFORMATION CARRIER AND APPARATUS FOR RECORDING INFORMATION ON THE INFORMATION CARRIER

BACKGROUND OF THE INVENTION

Field Of The Invention

[0001] The invention relates to an information carrier comprising an information area for recording data encoded in marks, said information area comprising tracks provided with a servo-pattern comprising headers alternating with track portions~~,~~. ~~which~~ The headers comprise a synchronization field ~~comprising~~ having marks representing a predetermined synchronization pattern for synchronizing a clock frequency in a device in which the information carrier is used ~~in~~, a first identification field comprising marks representing position information, and subsequently, a second identification field comprising marks representing position information.

[0002] The invention also relates to a reading device for reading data from the information carrier, ~~which~~ the reading device ~~comprises~~ comprising reading means for retrieving data from the information carrier, and to a recording device for recording data on the information carrier, ~~which~~ the recording device ~~comprises~~ comprising reading means for retrieving data from the information carrier and recording means for recording data on the information carrier.

[0003] Within the scope of this application, marks are considered to include all detectable regions on an information carrier, such as, for example, amorphous regions within a crystalline surrounding on an optical information carrier of the phase change type, or pits on an optical information carrier comprising embossed data. However, marks are not limited to optically detectable regions, but alternatively, magnetically or magneto-optically detectable regions may be used.

Description Of The Related Art

[0004] An information carrier according to the preamble is know from the European Computer Manufacturers Association Standards ECMA-153 and ECMA-154. Such an information carrier is also described in the Handbook of Magneto-Optical Data Recording; McDaniel, TW and Victora, RH; Noyes Publications; 1977. On the known information carrier, data is recorded in tracks, a track being formed by a 360 degree turn of a continuous spiral. Each track is subdivided, in the longitudinal direction, into a number of segments, each segment starting with a header. The data is recorded in the segment areas between the headers. The headers comprise patterns representing header information. This header information is used in a reading device (and in a recording device) to correctly assess (or record data) on the information carrier. In

general, the headers are made during manufacture, for example, in the form of so-called pre-pits formed by embossing.

[0005] Each header comprises a synchronization area, a so-called VFO field, for synchronizing a clock in the reading device (and in the recording device) in which the information carrier is used ~~in~~. Such a clock is, for example, generated by Variable Frequency Oscillator (VFO) circuitry located in the devices. This VFO field, consisting of a predetermined pattern of marks, is used to "lockup", that is, establish the proper frequency and phase of the read/write channel clock of the device when the header is read. More specifically, the VFO field establishes the write channel clock frequency and phase when a segment is being written, and it establishes the read channel clock frequency and phase when a segment is being read. In general, this "lockup" is realized by Phase ~~Lock~~-Locked Loop (PLL) circuitry which relates the read/write channel clock to a signal obtained from reading the synchronization pattern in the VFO field. The VFO field is also used to settle the slicer level of circuitry which converts an analog High Frequency (HF) signal, obtained from reading the patterns of marks and spaces representing the information, into a digital information signal. Furthermore, the VFO field is used to set the dynamic range of an Automatic Gain Controlled (AGC) amplifier ~~which~~, this amplifier ~~ensures~~ ensuring that the full range of ~~an~~ analog-to-digital conversion circuitry is utilized.

[0006] Each header further comprises an identification field, a so-called ID field, comprising position information. This ID field comprises pre-recorded address marks representing the address of a segment, that is, the track number and the segment number of the segment. The address marks representing the position information may be used for positioning a recording head in a recording device on a desired track and are indicative for the address of the segment area following the header. The position information in the headers is especially useful when no other data is recorded in the information area, because it is then the only way to determine the location of a reading spot on the information carrier.

[0007] In order to ensure a correct readout of the identification field in the header, ~~it~~ the identification field is preceded by the synchronization area. This ensures that the circuitry of the reading means is set such that the address marks in the identification field can be read correctly.

[0008] To further prevent erroneous retrieval of the position information from a header, each header comprises at least two identification fields. These two identification fields are spatially separated. Because of this, local deterioration of an information carrier, for example, caused by fingerprints or dust, may corrupt a first identification field while the second remains readable. Each identification field in a single header contains an identical address. However, because of a cyclic redundancy check (CRC) code word that extends across the identification field and

because of a number indicating whether the specific identification field is the first or the second ID field, the pattern of marks encoding the address in the first identification field may differ from the pattern of marks encoding the address in the second identification field.

[0009] It is a problem of the known information carrier that the headers are only capable of containing a limited amount of information. This is especially a problem when the headers are the only areas on an information carrier capable of holding pre-recorded information in the form of, for example, embossed pits.

SUMMARY OF THE INVENTION

[0010] It is inter alia an object of the invention to provide an information carrier which allows for the storage of pre-recorded additional information in the headers.

[0011] For this purpose, an information carrier as described in the opening paragraph, is characterized, according to the invention, in that the headers in at least a group of headers also comprise an information field located in between the first identification field and the second identification field, said information field comprising marks representing information. This has the effect that additional information is available in the headers.

[0012] In the known information carrier, each identification field in a header is preceded by a synchronization area. Because of this, the circuitry of the reading means is set before reading each of the identification fields in a single header. The invention is based on the understanding that setting the circuitry of the reading means before reading each of the identification fields is unnecessary when the successive identification fields are located close to each other as is the case in headers of an information carrier. Therefore, it is sufficient to have just a single synchronization area before the first identification field in a header and have the other identification fields replaced by information fields. In this way, space becomes available for storing additional information.

[0013] An embodiment of the information carrier according to the invention is characterized in that the information field comprises marks representing information describing properties of the information carrier. It is especially useful when the space, which becomes available for storing additional information, is used for storing information describing properties of the information carrier. When the information carrier is inserted into a reading device or into a recording device, header information, together with the information describing properties of the information carrier, can be retrieved and, on the basis of this information, the reading means or the recording means in the devices can be set

in such a way that they are adapted for the specific information carrier.

[0014] Examples of information describing properties of the information carrier which may be stored in the information fields in the headers of the information carrier are, inter alia, the number of recording layers, the type of the recording layers, the read power, the write power, the ratio of the erase power to the write power, the ratio of the bias power to the write power, parameters used in an Optimum Power Control (OPC) procedure in a recording device, and parameters describing the shape of a sequence of write pulses generated by a recording device to record data on the information carrier.

[0015] A further embodiment of the information carrier according to the invention is characterized in that the headers in a second group of headers also comprise a second synchronization field located in between the first identification field and the second identification field, said second synchronization field comprising marks representing a predetermined synchronization pattern for synchronizing a clock frequency in a device in which the information carrier is used ~~in~~. Information fields may be present in all headers of an information carrier or, alternatively, just in a group of headers. In the headers not comprising an information field, synchronization fields are located just before the

identification fields comprising marks representing position information.

[0016] When, for example, an information area comprises, successively, a lead-in zone comprising marks representing control information, a data zone intended for recording user data, and a lead-out zone comprising marks representing control information, the headers in the lead-in zone and in the lead-out zone may comprise information fields, while the headers in the data zone may comprise second synchronization fields.

[0017] An embodiment of the information carrier according to the invention is characterized in that the information is distributed over a sub-group of headers. When a large amount of information has to be stored in the information fields of the headers, this information is divided into parts and the parts are recorded in the information fields of various headers. Before the information can be retrieved from the information carrier, all parts have to be read from the various information fields.

[0018] A further embodiment of the information carrier according to the invention is characterized in that the information is distributed over a predetermined number of consecutive headers. In this way, the information can be retrieved from the headers very easily and very quickly because no jumps of the reading spot ~~the~~ in a radial direction are required.

[0019] To protect the distributed information recorded in the information fields from erroneous retrieval, this information may be protected by an error correction code. This error correction code is to be applied to all information in the information fields of the predetermined number of headers.

[0020] Further objects of the invention are to provide a reading device and a recording device capable of retrieving the additional information from the information carrier according to the invention.

[0021] This object is achieved by providing a reading device, as described in the opening paragraph ~~which is~~, characterized, according to the invention, in that the reading means ~~are arranged for retrieving~~retrieves information describing properties of the information carrier from an information field located in between the first identification field and the second identification field in the headers, and in that the reading means ~~are~~ is set in dependence on the retrieved information describing properties of the information carrier.

[0022] This object is also achieved by providing a recording device, as described in the opening paragraph, characterized, according to the invention, in that the reading means ~~are arranged for retrieving~~retrieves information describing properties of the

information carrier from an information field located in between the first identification field and the second identification field in the headers, and in that the recording means ~~are~~ is set in dependence on the retrieved information describing properties of the information carrier.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] These and other objects, features and advantages of the invention will be apparent from and elucidated further with reference to the embodiments of the invention described, by way of example, in the following description, and with reference to the accompanying drawings ~~where~~, in which:

[0024] ~~Figure~~ Fig. 1 shows an information carrier according to a first embodiment of the invention~~,~~;

[0025] ~~Figure~~ Fig. 2 diagrammatically shows a header~~,~~;

[0026] ~~Figure~~ Figs. 3a-3c ~~shows~~ show a schematic layout of a header according to an embodiment of the invention~~,~~;

[0027] ~~Figure~~ Fig. 4 shows an information carrier according to a second embodiment of the invention~~,~~; and

[0028] ~~Figure~~ Fig. 5 shows an embodiment of a reading device according to the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0029] ~~Figure~~ Fig. 1 shows a disc-shaped information carrier 1 of an optically readable type according to a first embodiment of

the invention. On this information carrier 1, tracks are formed by a single spiral groove, the Groove track 22, from the inside of the information carrier towards the outside of the information carrier and by a single spiral, the Land track 23, in between neighboring grooves. Each track is divided into 8 segments numbered segment0 to segment7. Each segment starts with a header area 3 comprising patterns of embossed pits and of spaces between the pits which represent header information. Data may be recorded in between the header areas 3 in both the Groove track 22 portions and the Land track 23 portions ~~in between the header areas 3~~.

[0030] ~~Figure~~ Fig. 2 shows a section along line b-b of the information carrier 1. A header area 3 is located in between segment1 and segment2. Segement1 and segment2 each comprise Groove tracks 22 and Land tracks 23. The header area 3 comprises Groove headers 32 related to the Groove tracks 22 and Land headers 33 related to the Land tracks 23. When the information carrier 1 is read, the Land headers 33 appear earlier in time than the Groove headers 32. The Groove headers 32 and the Land headers 33 comprise header information which is represented by a patterns of marks 31 in the form of embossed pits and of spaces 30 between the marks.

[0031] ~~Figure~~ Figs. 3 ~~shows~~a-3c show a schematic layout of a Groove header 32 or a Land header 33 within the header area 3. Each header consists of a number of fields 39, having a fixed total

storage capacity of, for example, 1080 channel bits, as is schematically shown in ~~figure~~ Fig. 3b. A Sector Mark field, SM, is generally located at the beginning of a header. This SM field contains a unique pattern allowing it to be easily found, and thus, unambiguously indicate the beginning of a header, and hence, of a segment.

[0032] A header comprises a VFO field, VFO1, and two ID fields, ID1 and ID2. The VFO field is used to "lockup", i.e., establish the proper frequency and phase of the read/write channel clock of the device when the header is read. The VFO fields are also used to settle the slicer level of circuitry which converts an analog High Frequency (HF) signal, obtained by reading the patterns of marks and spaces representing the information, into a digital information signal. Furthermore, the VFO fields are used to set the dynamic range of an Automatic Gain Controlled (AGC) amplifier which ensures that the full range of an analog-to-digital conversion circuit is utilized. A VFO field consists of a predetermined synchronization pattern of marks 31 and spaces 30.

[0033] The ID fields each comprise a pattern of marks 31 and spaces 30 representing the address of the segment. A first part of an ID field carries the track number, a second part carries the segment number, and a third part carries control information, such as a number identifying the first ID field, ID1, or the second ID field, ID2, and a cyclic redundancy check (CRC) code word. Both the first ID field, ID1, and the second ID field, ID2, in a single

header, comprise an identical track number and an identical segment number.

[0034] The header further comprises an information field DI. This information field DI holds information describing properties of the information carrier such as, for example, the number of recording layers, the type of the recording layers, the read power, the write power, the ratio of the erase power to the write power, the ratio of the bias power to the write power, parameters used in an Optimum Power Control (OPC) procedure in a recording device, and parameters describing the shape of a sequence of write pulses generated by a recording device to record data on the information carrier.

[0035] Information fields DI may be present in all headers of an information carrier 1 or, alternatively, just in a group of headers. In the headers not comprising an information field DI, a second synchronization field VFO2 is located just before the second identification field ID2, as is shown in ~~figure~~ Fig. 3c.

[0036] An information field DI in a header has a fixed storage capacity of, for example, 288 channel bits, i.e., 15 information bytes together with 52 control channel bits. This storage capacity may be insufficient to hold all of the information describing properties of the information carrier. ~~Now~~In this case, the information of several information fields DI of a sub-group of headers is grouped into an information frame carrying several

parameters, each parameter describing a property of the information carrier. In this way, the information is distributed over a sub-group of headers.

[0037] ~~Figure~~ Fig. 4 shows a disc-shaped information carrier 2 of an optically readable type according to a second embodiment of the invention. On this information carrier 2, groove tracks 22 are formed by a single spiral groove extending from the inside of the information carrier towards the outside of the information carrier. Each track is divided into 8 segments numbered segment0 to segment7. Each segment starts with a header. The information contained in the information fields DI in the headers of 16 consecutive headers 101 to 108 (that is, the headers in a first track 22) and 201 to 208 (that is, ~~de~~ the headers in a second consecutive track 22) is grouped together into a single information frame. In this way, the information frame has a storage capacity of 240 information bytes, i.e., 2 tracks times 8 segments times 15 information bytes/segment. The information in a single information frame may be protected by an error correction code such as, for example, a Reed-Solomon code.

[0038] The disc-shaped information carriers of an optically readable type are shown by way of example only. Moreover, the invention is not limited to optically readable information carriers. Alternatively, the invention may also be applied to, for example, magnetically or magneto-optically readable information

carriers. It should also be noted that the storage capacity of the fields in the headers is given merely by way of example. Other capacities may alternatively be employed.

[0039] ~~Figure~~ Fig. 5 shows a reading device, according to the invention, for reading the disc-shaped information carrier 1 of an optically readable type. The reading device comprises reading means 45 for reading information, such as the information in the synchronization field VFO1, the identification fields ID1 and ID2 and the information field DI, from the information carrier 1. The reading means 45 scans the tracks 22, 23 by way of a radiation beam 46. The radiation beam is generated by, for example, a diode laser located in the reading means 45. The information carrier 1 rotates, driven by driving means, while the reading means 45 reads the tracks 22, 23 by way of the beam 46 and convert the optically readable marks representing the information into an electric signal 47. The reading device also comprises decoding means 50 for converting the electric signal 47 into a digital information signal 48 and control means 55.

[0040] The information describing properties of the information carrier 1, stored in the information fields DI, is read by the reading means 45 and converted into a digital information signal 48 by the decoding means 50. Control means 55 extracts, from this digital information signal 48, the individual parameters, each parameter describing a property of the information carrier 1. Such

a parameter is, for example, the optimum read power for reading information from the information carrier 1. In dependence on the value of this parameter specifying the optimum read power, the control means 55 generates a control signal 49 controlling the read power in the reading means 45.

[0041] It should be noted that the above-mentioned embodiments illustrate rather than limit the invention, and that those skilled in the art will be able to design many alternative embodiments without departing from the scope of the appended claims. In the claims, any reference sign placed between parentheses shall not be construed as limiting the claim. The word "comprise" and its conjugations does not exclude the presence of elements or steps other than those listed in the claims.

ABSTRACT~~.~~ OF THE DISCLOSURE

~~The invention relates to a~~An additional information field DI is included in at least a group of headers 3 on an information carrier. The additional information field may be used to store information describing properties of the information carrier. This information can be stored in an information field DI of a single header or, alternatively, in the information fields DI of a sub-group of headers 3. When no information field DI is present in a second group of headers, a second synchronization field VFO2 may replace the information field DI.

~~Figure 3 to be added~~